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Procedia - Social and Behavioral Sciences 64 (2012) 584 – 593
Procedia
Social and Behavioral Sciences

INTERNATIONAL EDUCATIONAL TECHNOLOGY CONFERENCE
IETC2012

# Design and Development of Multimedia Pronunciation Learning Management System for Non-Native English Speakers

Fei Ping Por[a], Zarina Mustafa[b], Shuki Osman[c], Hooi San Phoon[d], Soon Fook Fong[e*]

[abcde]*Universiti Sains Malaysia, 11800 USM, Penang, Malaysia*

**Abstract**

Pronunciation continues to grow in importance because of its central roles in speech communication and speaker identity. However, correct pronunciation has been the concern among non-native English speakers as they tend to carry the intonation, phonological processes and pronunciation rules from their mother tongue into the pronunciation of English language. To address the issues of mispronunciation, this study designs and develops the Multimedia Pronunciation Learning Management System (MPLMS) by digitising the universally agreed system of phonetic symbols with full face motions or mouth movements. This paper discusses the design and development of the MPLMS based upon Alessi and Trollip's instructional system design model.


*Keywords:* Multimedia Pronunciation Learning Management System; design; development; Alessi and Trollip model

## 1. Introduction

Pronunciation continues to grow in importance because of its central roles in speech communication and speaker identity. Being able to communicate in English is relatively indispensable in today's world in the light of the increased people's mobility, joint study programmes, commercial networks, information technology, medicine, diplomacy, and many more. Moreover, the relationship between pronunciation and

* Corresponding author. Tel.: +6-012-525-4955.
*E-mail address*: sffong@usm.my

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social power cannot be dismissed (Mishra & Sharma, 2005). People with proficient pronunciation are commonly regarded as more professional and they are respected by given higher social status.

On the contrary, mispronunciation leads to embarrassment, misunderstanding and communication breakdown. The globalised business networks and commercial industries particularly require the people to communicate with their counterparts across borders in English. Miscommunication may thus cause unpleasant social relationships and the loss of investment.

In specific cases, non-native English speakers have the tendency of carrying the intonation, phonological processes and pronunciation rules from their mother tongue into the pronunciation of English language which causes incorrect pronunciation. For instance,

- Lack: Japanese language does not have the two sounds /l/ and /r/ as contrasting phonemes, and hence Japanese learners mistakenly produce "right" / raɪt/ as / laɪt/ (Aoyama, Flege, Guion, Akahane-Yamada, & Yamada, 2004).
- Substitution: Learners of Malay descent substitute /θ/ with / t/, such as "thin" / θɪn/ is replaced with /tɪn/ because /θ/ does not occur in Malay language (Cambridge University Press, 2002).
- Epenthesis: "Some" / sʌm / is mispronounced as / sʌmʊ / by learners in China. As there is no consonant, vowel, consonant (CVC) structure in Chinese ordinary speech, therefore, learners may insert one vowel to the last letter of words and CVC becomes CVCV (consonant, vowel, consonant, vowel) (Jenkins, 2000; Lai, Tsai, & Yu, 2009; Wang, 2003).
- Simplification: Thai learners reduce final clusters to a single manageable final consonant, such as "pump" /pʌmp/ is simplified as /pʌm/ (Cambridge University Press, 2002).

To address the issues of mispronunciation across all cultures, this study designs and develops the Multimedia Pronunciation Learning Management System (MPLMS) by using the universally agreed system of phonetic symbols, the International Phonetic Alphabet (IPA) throughout the whole repository. The phonetic symbols are digitised with clickable sounds accompanying full face motions or mouth movements (see Figure 1 and Figure 2 below) , which will make a profound impact on the new curriculum of teaching and learning of English pronunciation. As known, the phonetic symbols are widely accessible in dictionaries and they serve as a guide for standard English pronunciation. With the MPLMS of optimising the strengths of phonetic symbols, the learners are to be retrained for correct pronunciation understood by all (Por & Fong, 2011b).


Figure 1. MPLMS with Full Face Motions


Figure 2. MPLMS with Mouth Movements

The conventional method of face-to-face teaching is constrained by the limitations of accessibility, such as time, space and number of learners. Furthermore, a teacher can only repeat the pronunciation of a word for limited times and with varied quality each time. These limitations are to be overcome through the MPLMS which allows infinite repetition drills and practices with sustainable quality inputs but without the loss of patience and depletion of energy. An excellent teacher of pronunciation may only be able to teach 200 learners effectively at most, but the MPLMS is able to extensively reach out to millions and billions of learners. Hence, it is cost effective and is affordable by the real bottom billions in underdeveloped countries. In addition, the MPLMS provides individualized instruction and automatic visual support that demonstrates to learners how closely their own pronunciation approximates model utterances.

The MPLMS is to be realized through the synergy of educational technology, computer science, linguistics, and curriculum. It is not about replacing the classroom setting, but to enhance it and to take advantage of new content and delivery technologies to enable continuous learning of correct pronunciation.

## 2. Design and Development of MPLMS

The MPLMS, as its name suggests, is a web-based multimedia pronunciation content management system designed for non-native English speakers to improve their pronunciation accuracy. The MPLMS is a dynamic website with database management system and web application. Database is a collection of one or more data files or tables stored in a structured manner. In such manner, the interrelationships exist between different items or sets of data can be utilised by the data management system for manipulation and retrieval (Isrd Group, 2006). The data files in this study include audio files of phonetic symbols, syllables, sample words, minimal pairs; video files of full face motions and mouth movements; animations of 24 consonant phonemes, texts and graphics. Looking at the dynamic features of MPLMS, the online data can be maintained, customized and upgraded easily according to the current needs. Learners will always have the latest information. On the contrary, static websites which commonly found on the Internet are basic with stagnant content and the pages are limited to approximately 20. Moreover, the data can only be updated by programmer with knowledge of website development, whenever a change is needed the html (HyperText Markup Language) file needs to be re-opened, edited and saved. HTML is the basic coding protocol to display web pages and other information in a web browser.

The MPLMS turns the web to a dynamic user-centric collection of consistent and timely information (Strauss, 2002) in the learning of correct pronunciation. It is accessible through the Internet anytime, anywhere by unlimited number of people all over the world synchronously and asynchronously for quality sustainable learning. This is a digital evolution compared to the pronunciation learning software in the market where the learning contents and interactive practices are presented in CD format or in static websites in which information is hardly revised and the progress of individual user is difficult to be tracked in detail.

The three-phase Alessi and Trollip Instructional System Design (ISD) model – Planning, Design, Development – is adopted in the development of the MPLMS in view of its detailed and comprehensive development scheme from paper work to the actual end product. Alessi and Trollip stressed the importance of sequencing events and recommended the use of storyboarding to facilitate pilot testing on learners (Hunter & Ellis, 2000). This model is driven by principles of cognitive psychology, including perception and attention, encoding, memory, comprehension, active learning and individual differences (Alessi & Trollip, 2001). It is based on considering instruction from the perspective of the learners, unlike

traditional educational approaches which stem from the perspective of the content. The Alessi and Trollip ISD model is illustrated in Figure 3 below.

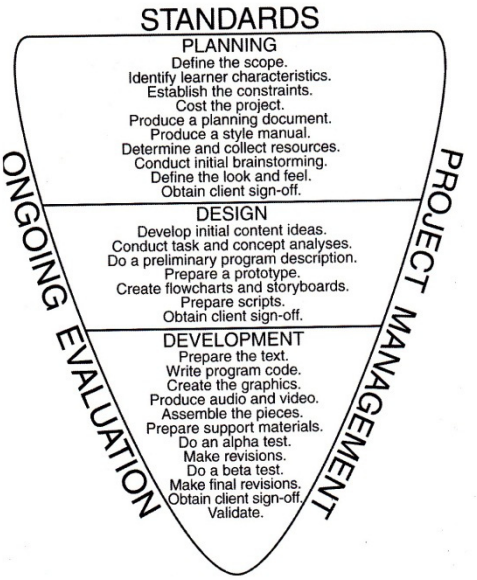


Figure 3. The Alessi and Trollip Instructional System Design (ISD) Model

In the Alessi and Trollip ISD model of developing the interactive MPLMS, there are three attributes which are always present – Standards, Ongoing Evaluation, and Project Management. They are the principles that applied to the whole process of design and development, and they form the good foundation. By clearly setting the standards, the development of the MPLMS is monitored to operate within the benchmark. Besides, ongoing evaluation is done at each stage whereby a continual iterative approach is employed until all functionalities have been achieved. The development is flexible with each step depends on the result of the previous step. Project management is another emphasis in this model to ensure the MPLMS is completed within the time frame and the allotted budget. With good project management, slippage can be contained while still maintaining desired standards (Por & Fong, 2011a).

### *2.1. Planning*

In this first phase – planning, a proper groundwork is laid to ensure all aspects of the system flow smoothly. It begins with defining the scope. The learning content of the MPLMS covers the sounds of phonetic symbols, including consonants, vowels, and diphthongs. Interactive enhancement exercises are also included. After the scope is defined, learner characteristics are assessed. The target learners of the MPLMS are young non-native English speakers aged between 10 and 12. These young learners should be exposed to their second language or foreign language as early to allow them optimise their learning potential and help shape the brain at its flexible stage. Children at this range of age have acquired basic computer literacy which enables them to navigate the MPLMS meaningfully. Constraints of the system development are established to ensure issues that impact the design and development are studied, such as

the compatibility of hardware and server system, the potential software, available budget, deadlines and relevant permissions to be obtained. The stages of the study are clearly set in the planning phase to monitor the progress and to ensure milestone achievement is accomplished according to schedule. Table 1 below demonstrates the stages of this study.

Table 1. The Stages of Design and Development MPLMS

| Stage No. | Description |
|---|---|
| 1 | Prepare needs, syllabus, task and concept analyses |
| 2 | Outline instructional design |
| 3 | Draft storyboards |
| 4 | Build prototype |
| 5 | Do video recording |
| 6 | Edit the recordings and convert them into 3 modes: full face motions, mouth movements, sound only |
| 7 | Conduct usability test |
| 8 | Collect, analyse data and revise prototype |
| 9 | Complete the development of the MPLMS |
| 10 | Conduct usability test and revise the MPLMS |
| 11 | Validate the MPLMS |
| 12 | Complete the final product of the MPLMS |
| 13 | Do write-ups on the learning modules and reports |

### *2.2. Design*

The design phase is the most creative as it deals with the activities of assembling the content and deciding on how it is to be treated from both an instructional and interactive perspective that will help the target learners achieve the intended learning outcomes.

#### *2.2.1.Conduct task and concept analyses*

Task analysis is used primarily for procedural skills, whereas concept analysis is generally used for viewing concepts and their interrelationships. The algorithm refers to the computational procedure for solving a problem in a finite number of steps. The basic analyses are illustrated in Figure 4 and Figure 5.

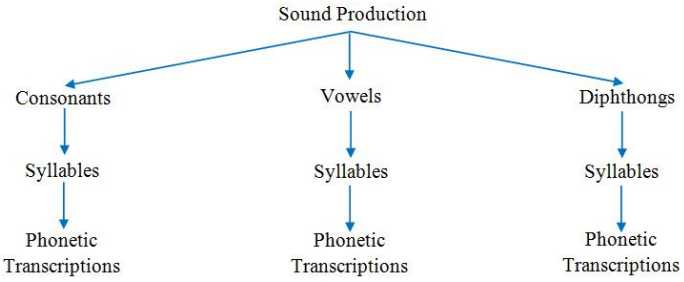


Figure 4. Task Analysis of Sound Production

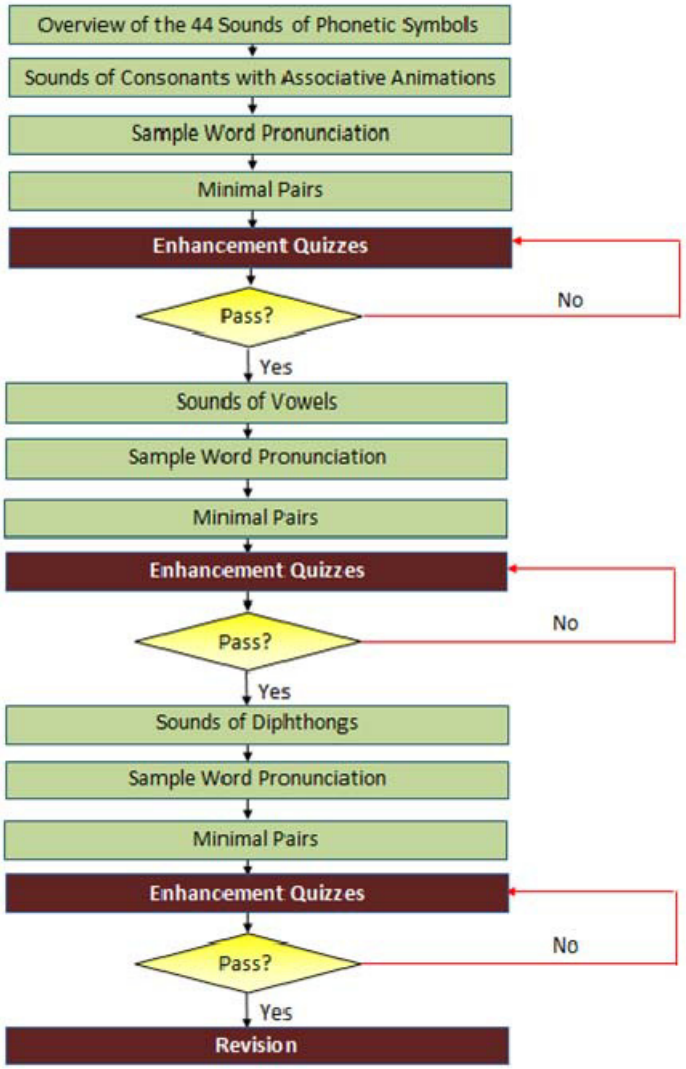


Figure 5. Concept Analysis of the MPLMS

### *2.2.2.Prepare prototype and create flowchart*

After analysing the tasks and concepts, all the ideas are integrated for the MPLMS to work as a whole. A prototype is prepared to illustrate a concrete example for others to react to it and provide feedback (see Figure 6). The aim of prototyping is to enable inputs from the experts and end users at an early stage by giving them the look and feel of the application. Similarly, flowchart reveals the structure and sequence of the instruction. A good flowchart reduces the risk of poor programming. The flowchart that shows the programme sequence of the MPLMS from beginning to end is presented in Figure 7.


Figure 6. Prototype of the MPLMS

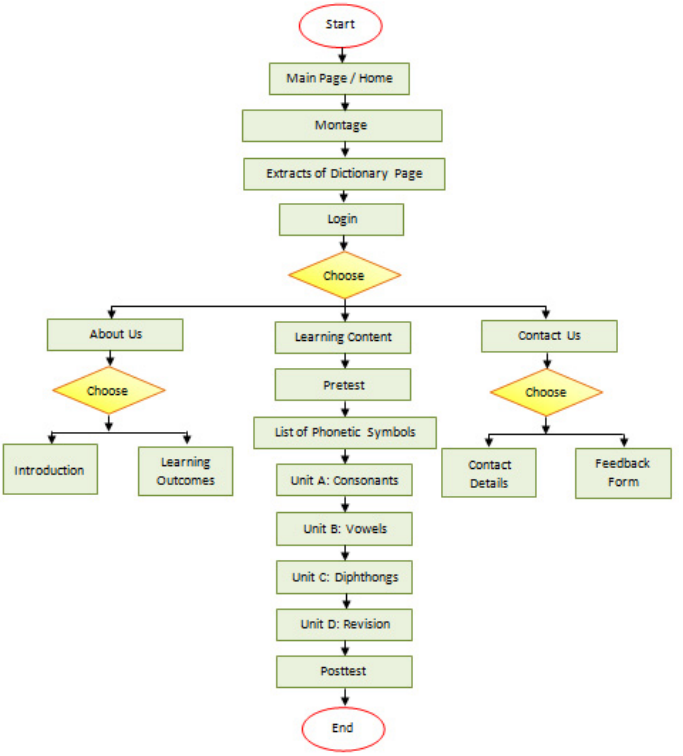


Figure 7. Flowchart of the MPLMS

### 2.3. Development

The third phase is taking the design of the MPLMS and turning it into a robust system. The development is a collaborative process. It includes the preparation and production of texts, graphics, audio and video materials, as well as the development of support materials. It is a demanding part of the overall process and requires a variety of skills. The overall database relationship for the development is summarized in Figure 8 below.

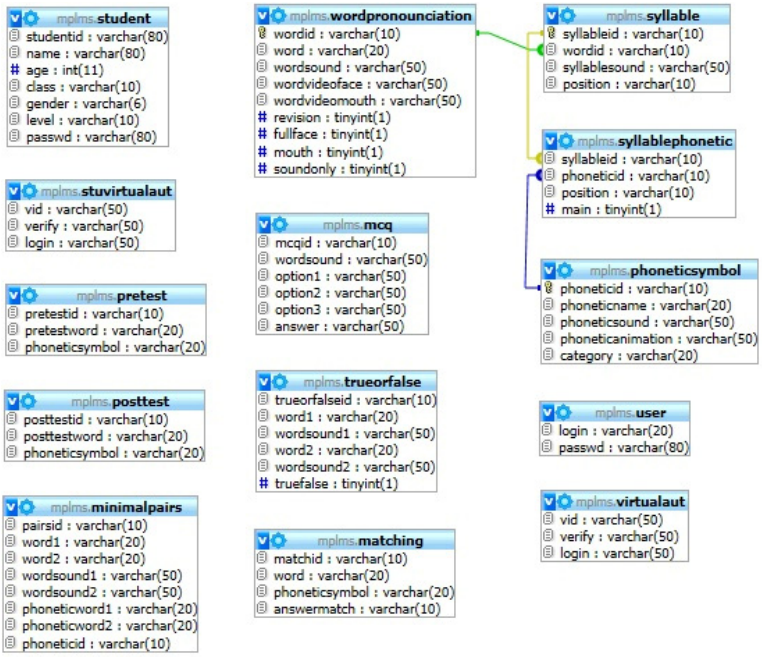


Figure 8. Database Relationship

In this study, the viability of the MPLMS is evaluated through a series of formative tests, and usability testing is also conducted to evaluate the ease of use, aesthetics as well as the educational efficiency of the system. Formative evaluation is used with the intention of improving the quality of the MPLMS throughout its design and development by examining the delivery of the system, the quality of its implementation and the organisational context, structures and procedures (Bevan, Singhal, Werner, Degler, & Wilson, 2009). The usability testing is essential for the overall quality of learning and the system on the basis of interface. Usability ensures the ease of learnability of the learning environment, user-friendliness and visually attractive which increases the effectiveness (Durdu, Yalabik, & Cagiltay, 2009). Ongoing evaluation and revision are essential elements throughout the whole development process to ensure the finished product of MPLMS is robust and effective to help learners attain the desired learning outcomes. During the entire development phase, the costs and time are monitored closely to ensure the MPLMS is done on time and within the allotted budget.

## 3. Conclusion

To provide relevant educational tool, the MPLMS is pedagogically addressed and theoretically based. The design and development start from a well-articulated theoretical position and an overall goal for performance is determined in consideration of the learners' characteristics, language proficiency and needs. The learning contents are also built in such a way of developing pronunciation skills in stages by allowing learners to navigate the programmes sequentially. Total freedom of leaving the learners clicking the buttons randomly and aimlessly may not achieve positive learning outcomes (Pennington, 1999).

This paper provides a comprehensive overview of the design and development of the MPLMS which is convincingly expected to supplement the learning of pronunciation among non-native English speakers. The MPLMS is designed and developed in a systematic process within the context based upon Alessi and Trollip Instructional System Design (ISD) model that help reduce both the product's development time and costs while ensuring quality.

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